

THE CHINESE UNIVERSITY OF HONG KONG

Department of Information Engineering

Seminar

Broadband Wireless Access over Fibre-connected Massively Distributed Antennas

by

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Date : 4 November, 2011 (Friday)
Time : 2:00-3:00pm
Venue : Room 833, Ho Sin Hang Engineering Building
The Chinese University of Hong Kong

Abstract

Wireless access architectures employing femto- and pico-cell base-station/access point can reduce power consumption and enhancing wireless spectrum utilization by shortening the links and exploiting cooperative and cognitive mechanisms, but co-ordinations between base-stations or access points may incur large overheads. We present a novel architecture that exploit wireless-optical convergence for next generation broadband wireless access employing fibre-connected massively distributed antennas (BWA-FMDA). In this architecture, a large number of distributed antennas are connected via radio over fibres (RoF) to a centralized processing entity to minimize the communication overhead of system co-ordination. The coverage area of the proposed BWA-FMDA system can range from a few tens of square meters in homes and office environments, delivered via IEEE 802.11a/g/n or femto-cell hotspot solutions, to several square kilometers supporting last-mile technologies such as WiMAX, LTE, and LTE-A using pico- and micro-base-stations. This new architecture leads to many new research problems, including the fundamental performance limits of massively distributed antenna systems, improved measurement-based channel models involving massively distributed antennas, advanced radio resource management and access control schemes that approach the performance limits in realistic propagation environments, and improved opto-electronic transceivers designs for low cost active optical cables suitable for RoF applications. In this talk we demonstrate the potentials of BWA-FMDA architecture by considering its application in license-free and licensed wireless systems. We present the cognitive WLAN over fibre (CWLANoF) system, which applies the BWA-FDMA architecture in the license-free ISM band for cooperative spectrum sensing, interference avoidance/mitigation and dynamic channel assignment. BWA-FMDA can also be applied in licensed bands to create coordinated multiple point (CoMP) operations of femto-cells, which provides higher spectral efficiency (bps/Hz) and higher energy efficiency (bits/Joule). Simulation results and address potential research issues are presented for each scenario. We conclude with a short discussion on our current effort to develop and deploy a BWA-FMDA testbed based on commercially available equipment.

Biography

Victor C. M. Leung received the B.A.Sc. (Hons.) degree in electrical engineering from the University of British Columbia (U.B.C.) in 1977, and was awarded the APEBC Gold Medal as the head of the graduating class in the Faculty of Applied Science. He attended graduate school at U.B.C. on a Natural Sciences and Engineering Research Council Postgraduate Scholarship and completed the Ph.D. degree in electrical engineering in 1981.

From 1981 to 1987, Dr. Leung was a Senior Member of Technical Staff at MPR Teltech Ltd., specializing in the planning, design and analysis of satellite communication systems. In 1988, he started his academic career at the Chinese University of Hong Kong, where he was a Lecturer in the Department of Electronics. He returned to U.B.C. as a faculty member in 1989, currently holds the positions of Professor and TELUS Mobility Research Chair in Advanced Telecommunications Engineering in the Department of Electrical and Computer Engineering. He is a member of the Institute for Computing, Information and Cognitive Systems at U.B.C. He also holds adjunct/guest faculty appointments at Jilin University, Beijing Jiaotong University, South China University of Technology, the Hong Kong Polytechnic University and Beijing University of Posts and Telecommunications. Dr. Leung has co-authored more than 500 technical papers in international journals and conference proceedings, and several of these papers had been selected for best paper awards. His research interests are in the areas of architectural and protocol design, management algorithms and performance analysis for computer and telecommunication networks, with a current focus on wireless networks and mobile systems.

Dr. Leung is a registered professional engineer in the Province of British Columbia, Canada. He is a Fellow of IEEE, a Fellow of the Engineering Institute of Canada, and a Fellow of the Canadian Academy of Engineering. He is a Distinguished Lecturer of the IEEE Communications Society. He is serving on the editorial boards of the IEEE Transactions on Computers, IEEE Wireless Communications Letters, Computer Communications, the Journal of Communications and Networks, as well as several other journals. Previously, he has served on the editorial boards of the IEEE Journal on Selected Areas in Communications – Wireless Communications Series, the IEEE Transactions on Wireless Communications and the IEEE Transactions on Vehicular Technology. He has guest-edited several journal special issues, and served on the technical program committee of numerous international conferences. He is a General Co-chair of GCSG Workshop at Infocom 2012, GCN Workshop at ICC 2012, CIT 2012, FutureTech 2012, CSA 2011. He is a TPC Co-chair of the MAC and Cross-layer Design track of IEEE WCNC 2012. He chaired the TPC of the wireless networking and cognitive radio track in IEEE VTC-fall 2008. He was the General Chair of AdhocNets 2010, WC 2010, QShine 2007, and Symposium Chair for Next Generation Mobile Networks in IWCMC 2006-2008. He was a General Co-chair of Chinacom 2011, MobiWorld and GCN Workshops at IEEE Infocom 2011, BodyNets 2010, CWCN Workshop at Infocom 2010, ASIT Workshop at IEEE Globecom 2010, MobiWorld Workshop at IEEE CCNC 2010, IEEE EUC 2009 and ACM MSWiM 2006, and a TPC Vice-chair of IEEE WCNC 2005. He is a recipient of an IEEE Vancouver Section Centennial Award.

**** ALL ARE WELCOME ****

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